

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**

What is claimed is:

1. An ultrasonic diagnostic device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the
5 ultrasonic diagnostic device comprising:

an image generating unit operable to successively generate an ultrasound image;

a quantity extracting unit operable to extract a characteristic quantity related to the object within the generated ultrasound
10 image;

a time stamp generating unit operable to generate a time stamp indicating a time at which the ultrasound image has been generated and to associate the time stamp with the extracted characteristic quantity to make a pair;

15 an interpolating unit operable to perform interpolation using a plurality of pairs made by the time stamp generating unit so as to generate new characteristic quantities corresponding to times other than times indicated by time stamps contained in the plurality of pairs;

20 an information generating unit operable to generate diagnostic information on the object in accordance with the new characteristic quantities; and

a display unit operable to display the generated diagnostic information.

25

2. The ultrasonic diagnostic device of Claim 1,

wherein each of the characteristic quantities is a volume of the object.

30 3. The ultrasonic diagnostic device of Claim 1, further comprising:

a pulsation detecting unit operable to detect every pulsation related to the object; and

a clock unit operable to measure an elapsed time from the detection of each pulsation,

wherein a time indicated by each time stamp is an elapsed time measured by the clock unit.

5

4. The ultrasonic diagnostic device of Claim 3, wherein the interpolating unit (a) superimposes a plurality of characteristic quantities over one another within a single pulsation cycle, the plurality of characteristic quantities having been extracted over a plurality of pulsation cycles, and (b) performs the interpolation between the superimposed characteristic quantities to generate the new characteristic quantities.

10

5. The ultrasonic diagnostic device of Claim 4, wherein before superimposing the plurality of characteristic quantities over one another, the interpolating unit normalizes the plurality of pulsation cycles to generate the single pulsation cycle by correcting time stamps associated with the plurality of characteristic quantities.

15

20

6. The ultrasonic diagnostic device of Claim 3, wherein the interpolating unit performs the interpolation using the plurality of pairs that each contain a time stamp and a characteristic quantity related to an ultrasound image in first sectional view so as to generate new characteristic quantities related to the first sectional view, and

25

the information generating unit includes:

an intersecting data obtaining unit operable to obtain a characteristic quantity related to an ultrasound image in second sectional view from the quantity extracting unit and to obtain a time stamp associated with the obtained characteristic quantity from the time stamp generating unit, the first and second sectional views

30

intersecting at a predetermined view;

a data specifying unit operable to specify a characteristic quantity out of the new characteristic quantities related to the first sectional view, the specified characteristic quantity being associated with a time stamp that indicates a same time as the time stamp obtained by the intersecting data obtaining unit; and

a data generating unit operable to generate the diagnostic information by using the specified characteristic quantity and the obtained characteristic quantity.

7. The ultrasonic diagnostic device of Claim 6,

wherein the intersecting data obtaining unit also performs interpolation using a plurality of pairs that each contain: (a) a characteristic quantity related to the second sectional view; and (b) a time stamp associated with the characteristic quantity, and generates a new characteristic quantity related to the second sectional view, and

the data specifying unit specifies a characteristic quantity related to the first sectional view, the specified characteristic quantity being associated with a time stamp indicating a same time as a time stamp associated with the new characteristic quantity related to the second sectional view.

8. The ultrasonic diagnostic device of Claim 6, wherein

each time the image generating unit generates an ultrasound image in the second sectional view, the data generating unit generates diagnostic information, and

each time the diagnostic information is generated, the display unit displays the diagnostic information.

9. The ultrasonic diagnostic device of Claim 6, wherein

the object is an left ventricle (LV) of a heart,

each characteristic quantity is contour data that specifies a contour of an endocardium of the LV, and

the diagnostic information shows an LV volume (LVV), which is obtained by substituting the contour data into an approximate expression.

10. The ultrasonic diagnostic device of Claim 9, wherein the contour data indicates a length that specifies a slice related to the contour, and

the approximate expression is in accordance with the Modified Simpson method.

11. The ultrasonic diagnostic device of Claim 10, further comprising

a volume specifying unit operable to specify a maximum and a minimum of the volume in a pulsation cycle by using the volume shown in the diagnostic information.

12. An image processing device that generates and displays diagnostic information on an object that is subject to examination by using an ultrasound image containing an image of the object, the ultrasound image being generated based on reflection of ultrasound, wherein

the ultrasound image is associated with a time stamp indicating a time at which the ultrasound image has been generated, and

the image processing device comprises:

an extracting unit operable to extract a characteristic quantity related to the object within the generated ultrasound image;

an interpolating unit operable to perform interpolation using a plurality of pairs to generate new characteristic quantities, each of

the plurality of pairs containing: (a) a characteristic quantity extracted by the extracting unit from an ultrasound image; and (b) a time stamp associated with the ultrasound image, the new characteristic quantities corresponding to times other than times indicated by time stamps contained in the plurality of pairs;

an information generating unit operable to generate the diagnostic information in accordance with the new characteristic quantities; and

a display unit operable to display the generated diagnostic information.

13. An ultrasonic diagnostic device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the ultrasonic diagnostic device comprising:

a signal receiving unit operable to receive an electrocardiogram (ECG) signal related to the object;

an end-time predicting unit operable to predict at least one of an end-diastolic time and an end-systolic time from at least one of a past end-diastolic time and a past end-systolic time that the end-time predicting unit has specified using the received ECG signal; and

an image generating unit operable to generate an ultrasound image at the at least one of the predicted times.

14. The ultrasonic diagnostic device of Claim 13,

wherein the end-time predicting unit predicts either the end-diastolic time or the end-systolic time from either a plurality of past end-diastolic times or a plurality of past end-systolic times, each of which the end-time predicting unit has specified by: (a) detecting a first end-time and a second end-time, wherein at the first end-time, a value of the ECG signal changes from a local

negative maximum to zero, and wherein at the second end-time, a value of the ECG signal changes from a plus value to zero; and (b) regarding the detected first and second end-times as a past end-diastolic time and a past end-systolic time, respectively.

5

15. An ultrasonic diagnostic device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the ultrasonic diagnostic device comprising:

10 an information calculating unit operable to calculate diagnostic information from the ultrasound image;

a time predicting unit operable to predict a time at which the calculated diagnostic information takes a characteristic value by using the diagnostic information; and

15 an image generating unit operable to generate an ultrasound image for the object at the predicted time.

16. The ultrasonic diagnostic device of Claim 15, wherein the diagnostic information shows a volume of the object, and

20 the characteristic value is either a local maximum or a local minimum of the volume.

17. An image processing device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the image processing device comprising:

25 a signal receiving unit operable to receive an electrocardiogram (ECG) signal related to the object;

an end-time predicting unit operable to predict at least one of an end-diastolic time and an end-systolic time from at least one of a past end-diastolic time and a past end-systolic time that the end-time predicting unit has specified using the received ECG

30

signal; and

an image generating unit operable to generate an ultrasound image at the at least one of the predicted times.

5 18. An image processing device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the image processing device comprising:

10 an information calculating unit operable to calculate diagnostic information from the ultrasound image;

a time predicting unit operable to predict a time at which the calculated diagnostic information takes a characteristic value by using the diagnostic information; and

15 an image generating unit operable to generate an ultrasound image for the object at the predicted time.

19. A program to have a computer function as an ultrasonic diagnostic device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the program including:

20 an image generating step for successively generating an ultrasound image;

25 a quantity extracting step for extracting a characteristic quantity related to the object within the generated ultrasound image;

a time stamp generating step for generating a time stamp indicating a time at which the ultrasound image has been generated, and associating the time stamp with the extracted characteristic quantity to make a pair;

30 an interpolating step for performing interpolation using a plurality of pairs made in the time stamp generating step so as to generate new characteristic quantities corresponding to times other

than times indicated by time stamps contained in the plurality of pairs;

an information generating step for generating diagnostic information on the object in accordance with the new characteristic quantities; and

a display step for displaying the generated diagnostic information.

20. A program to have a computer function as an image processing device that generates and displays diagnostic information on an object that is subject to examination by using an ultrasound image containing an image of the object, the ultrasound image being generated based on reflection of ultrasound, wherein the ultrasound image is associated with a time stamp indicating a time at which the ultrasound image has been generated, and

the program includes:

an extracting step for extracting a characteristic quantity related to the object within the generated ultrasound image;

an interpolating step for performing interpolation using a plurality of pairs to generate new characteristic quantities, each of the plurality of pairs containing: (a) a characteristic quantity extracted in the extracting step from an ultrasound image; and (b) a time stamp associated with the ultrasound image, the new characteristic quantities corresponding to times other than times indicated by time stamps contained in the plurality of pairs;

an information generating step for generating the diagnostic information in accordance with the new characteristic quantities; and

a display step for displaying the generated diagnostic information.

21. A program to have a computer function as an ultrasonic

diagnostic device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the program including:

a signal receiving step for receiving an electrocardiogram

5 (ECG) signal related to the object;

an end-time predicting step for predicting at least one of an end-diastolic time and an end-systolic time from at least one of a past end-diastolic time and a past end-systolic time that have been specified in the end-time predicting step by using the received ECG

10 signal; and

an image generating step for generating an ultrasound image at the at least one of the predicted times.

22. A program to have a computer function as an ultrasonic
15 diagnostic device that generates and displays an ultrasound image containing an image of an object which is subject to examination in accordance with reflection of ultrasound, the program including:

an information calculating step for calculating diagnostic information from the ultrasound image;

20 a time predicting step for predicting a time at which the calculated diagnostic information takes a characteristic value by using the diagnostic information; and

an image generating step for generating an ultrasound image for the object at the predicted time.

25